THE EFFECTS OF FIELD-OF-VIEW ON PILOT PERFORMANCE IN THE C-130 WST

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ABSTRACT

In order to provide a cost effective simulator training environment, a number of variables must be optimized to meet training requirements with minimum cost. One such variable is the field-of-view (FOV) of the visual display. This study investigated the effect of field-of-view on pilot performance for low level flight and an airdrop in the C-130 weapon system trainer. The study was performed using two different field-of-view configurations. The conditions were wide field-of-view that used all six windows to provide a 160°H by 35°V visual field and a limited field-of-view that used the forward four windows to provide a 102°H by 35°V visual field from the left seat (pilot's). The tasks chosen by subject matter experts for the study were thought to be those most likely to require information from the peripheral windows. Automated pilot performance measures and eye position data were collected throughout the study. Twelve experienced C-130 pilots performed four trials over two different routes under both field-of-view conditions. The pilot performance data showed no strong or consistent effects due to the field-of-view manipulation. The eye position data revealed an increased use of the front window and instruments in the limited field-of-view condition and a decreased use of the window to the left of the pilot. The study shows that the peripheral windows may not be required for experienced pilots, but if present are used, and if absent, alter visual behavior. Based on the results of the study, a preliminary conclusion would be to provide a wide FOV when the training objectives include tasks that use a large amount of peripheral information. Before any final conclusions can be reached regarding field-of-view requirements, the use of the windows from the copilot's position should be addressed, as well as the value for skill acquisition for less experienced pilots.

INTRODUCTION

The field-of-view provided by the visual system is an important determinant of the number and type of tasks that can be trained in the simulator. The visual field-of-view influences the interaction between vision, motion perception, and vehicle control. Factors affected by field-of-view are perceptions of depth, altitude, and motion. Pilot control strategy may also be impacted by the size and placement of the field-of-view. Additionally, there is often a trade-off between the amount of scene detail available and FOV size. The ideal situation is to provide the same visual area as available in the aircraft. This approach may be impractical for operational simulators due to the cost for full FOV systems. The size of the visual display needs to be related to training objectives and demonstrated effectiveness.

The traditional approaches used to determine the desired or required FOV for simulators use either questionnaires or performance data. The questionnaire approach evaluates pilot opinion for specific FOVs. Although this type of data collection is widely used, it suffers from being subjective in nature, gives no indication of the portion of the FOV being used, or where attention is allocated. The pilot performance approach uses measures taken from the simulator as the pilot performs a mission. The measures are either compared to other FOV configurations or compared against a criterion. However, performance measures do not allow for the possibility that different strategies might be used by the pilot that result in equivalent performance levels.

A summary of research relating to FOV requirements by Collyer, Ricard, Anderson, Westra, and Perry (1980) for straight-in landings and takeoffs, found that safe and acceptable straight-in landings and takeoffs could be performed in FOV configurations with dimensions of 10°H by 10°V, 21.5°H by 21.5°V, and 5.7°H by 37°V. The pilots' performance was rated by pilots positioned outside the simulator and FOV determinations of safe and acceptable were based on raters' recommendations. The most important finding in this series of studies was that acceptable performance was obtained with FOV configurations that were significantly smaller than commonly being used in simulation. Other studies by Perry et al, (1977) compared performance across two FOV's for take-offs and landings found no significant differences between a 36°H by 48°V FOV and a 300°H by 150°V FOV. These results are consistent, suggesting that under normal conditions, a relatively small FOV can be used to train straight-in landings and takeoffs.

Field-of-view requirements for other contact maneuvers have also been investigated. In three studies from 1977-1979, FOV was used as a research variable, in conjunction with other environmental factors (Irish et al, 1977, Irish and Buckland, 1978, Nataupsky et al, 1979). Undergraduate pilot students performed aileron rolls, barrel rolls, and the 360 degree overhead pattern. Under various FOVs these studies showed the effect of the FOV variable is extremely task specific for the investigated maneuvers, but generally performance improved as the FOV increased. There is considerable interest in the FOV requirements for operational mission training including tasks such as low level flight, aerial refueling, air-to-air, and air-to-ground manuevers. The present study investigated the effects of FOV manipulations on mission related tasks of the C-130.

BACKGROUND

The primary mission of the C-130 is the movement of cargo and personnel from one location to another. This is done in a variety of environmental conditions, combat areas, airfields, and terrain. The mission can be subdivided into the airland mission and the airdrop mission. The airland mission involves transporting cargo and personnel between two airfields. The airdrop mission involves aerial extraction of cargo and personnel from the C-130 to a designated drop zone.

The C-130 Weapons System Trainer (WST) is an important training tool used to prepare C-130 aircrews. The C-130 WST is used for initial and mission qualification/requalification, continuation training, conversion training and upgrade/-specialized training. Each phase has associated training objectives and tasks that include aircrew readiness, premission and postmission procedures, aircraft systems, normal procedures, task performance, and emergency procedures. Performance of the airland and airdrop missions are incorporated into the various training phases. The C-130 WST supports each phase by providing aircrews and individual pilots the opportunity to practice the primary tasks in a full mission environment.

The FOV for the C-130 WST and other simulators is a very important determinant for the number of tasks that can be effectively trained in the simulator. The need for a forward window has been well established in previous research, but the need for peripheral windows is still a question of importance. The overall mission profile of the C-130 includes many tasks that may or may not be affected by the information available in the peripheral portions of the visual field. An important step in determining FOV requirements for the C-130 and other aircraft is to determine which mission tasks need the most peripheral information. If these tasks are of major importance, research efforts should be conducted to determine how much FOV is required. The study reported in this paper was designed to assess the importance of visual information presented in the most peripheral side windows of the C-130 WST by performing tasks thought likely to require peripheral information. In addition, an eye monitor was used to asesss any differences in the visual behavior between the two FOV configurations.

In an earlier study conducted on the C-130 WST (Hubbard, Kellogg, and Seiverding), the effects on pilot performance of two alternative FOV configurations were assessed on performance of assault landings. The two FOV conditions were full FOV (all six windows) and a two window (forward and left window) configuration. Order of FOV was counterbalanced. The pilots were initialized 2.2 NM on final approach and instructed to maintain optimum flight parameters as closely as possible. The performance measures (airspeed, descent rate, angle of attack, altitude and centerline deviation) were captured at .5 NM, threshold, and touchdown. There were no main effects attributed to FOV. There were, however, a couple of significant effects attributable to the interaction of FOV and order of FOV alternation, indicating an effect of FOV as a function of which FOV condition was experienced first. This is a difficult finding to relate to the existing literature.

A problem that could have affected the above study is data collection at discrete points. This may have caused some of the significant performance effects that were present to be masked over. The pilot could easily correct any deviations between two points of data capture, thus limiting the amount and kind of data available for analysis. A continious data collection would allow all points of interest to be closely examined and any changes in performance could be easily identified.

In order to overcome some of the problems of the above study, the study reported in this paper examined pilot performance using different FOV configurations (four vs. six windows), continuous data collection, and different tasks (low level navigation and a drop). The navigation tasks required several large heading changes in route to the drop zone. The tasks that were chosen were considered to be most dependent on peripheral cues by subject matter experts. In addition, an eye monitor was used to determine the eye focal point during the tasks. The basis for the using the eye monitor is to determine if the pilot's visual behavior is altered in the different FOV configurations.

METHOD

Subjects

Twelve male C-130 pilots with a crew qualification of instructor pilot or aircraft commander served as subjects for this study. The means of the total C-130 hours and the total flight hours were 1740 hrs and 2549 hrs, respectively.

Apparatus

The study was conducted on the C-130 WST located at Little Rock AFB, Ark. The C-130 WST is a full mission simulator which provides computer-generated imagery for out-of-the-window visual cues. The visual system produces day, dusk, and night scenes through a six window, five channel, color CRT display system with infinity optics. The image generator is capable of generating 8000 visible edges and 4000 point lights simultaneously. Other system features include textured surfaces, seven simultaneous moving models (aircraft, missiles, or land vehicles), threats, and instructor controlled weather effects.

The six windows in the display can be turned on or off independently to provide various configurations for research purposes (see Figure 1). The area of interest for this effort was the effect of the peripheral cues on flight performance. This study used two window configurations to examine the effects of FOV on task performance. The full FOV condition (all windows on) provided the pilot with a 160°H by 35°V and the limited FOV condition (windows 3 and 6 turned off) provided a

$102^{o}H$ by $35^{o}V$ FOV from the pilots head position (see Figure 2).

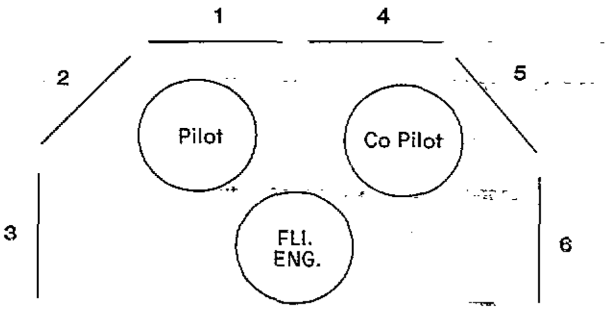


Figure 1: C-130 WST Window Configuration

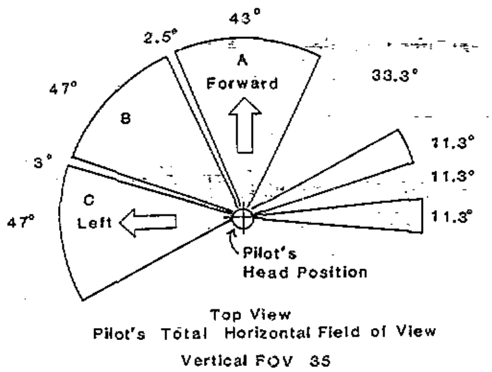


Figure 2: C-130 WST Pilot's Field of View

Performance Measurement.

Objective data was collected at a continuous 10 hertz update rate from the visual interface of the simulator. The performance measures included pilot control inputs and system parameters (see list in Experimental Design Section).

A second source of data was collected from an eye movement monitor/camera. The eye movement device used photoelectric sensing and processing techniques to determine focal point, magnitude and direction of eye movements (see Appendix A for System Specifications). The eye movement device allowed free head movement. The visual scene and associated focal points were recorded on videotape and timecoded to a hundredth of a second accuracy. Examples of eye focal point scenes are included in Figures 3, 4, and 5.

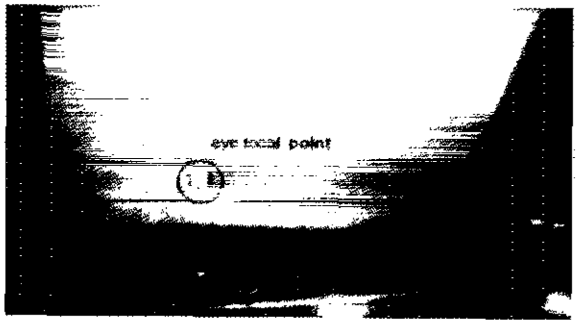


Figure 3. Eye-Position of C-130 Pilot in Simulator Front Window

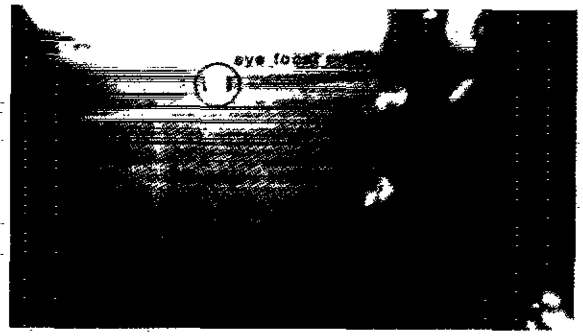


Figure 4. Eye-Position of C-130 Pilot in Simulator Side Window

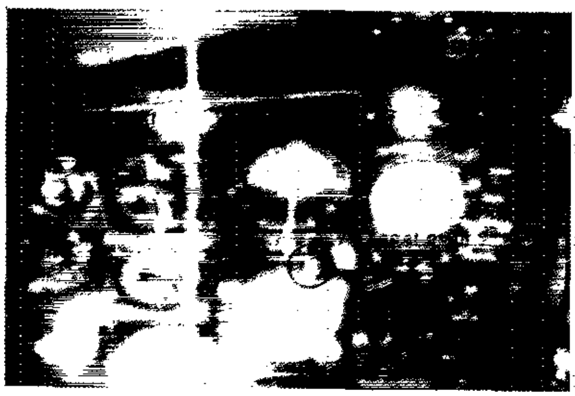


Figure 5. Eye-Position of C-130 Pilot in Simulator - Instrument Panel

Task Description

The basic task was low level navigation to a drop and escape. The ingress section consisted of two legs, each requiring heading changes. The third leg consisted of a drop followed by a short egress section. Two similiar mission routes were designed for the study. Each route included two low level portions followed by an airdrop segment. The terrain of both routes was slightly mountainous over wooded areas (Ozark National Forest). The routes are essentially equivalent in design and terrain. For route 1 (see Figure 6), the aircraft was positioned at a predetermined point (Road Bend) at 300 ft AGL. The pilot was instructed to maintain 210 Knots, 300 ft AGL , and a heading of 103 degrees. After approximately 7.2 miles (Road Bend), a heading change was made to 047 degrees for 4.3 miles (River Y) followed by a heading change to 029 for 1.2 miles. At this point (Highway 7) the pilot performed a slowdown maneuver (400 ft AGL, 130 Knots) to position the aircraft for the airdrop. After locating the dropzone and configuring the aircraft (flaps lowered, complete pre-drop checklist) for the drop, the pilot increased airspeed and altitude for a short escape segment.

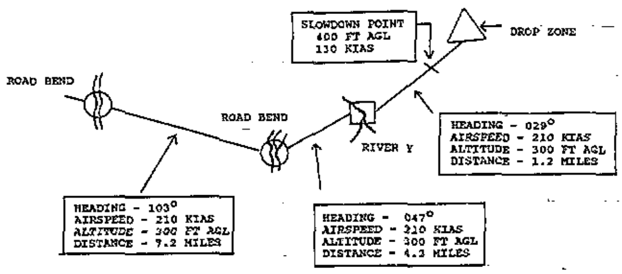


FIGURE 6: FLIGHT PROFILE FOR ROUTE 1

Route 2 (see Fig 7) used the same altitudes, airspeeds and drop zone. The initial point was located at a lock and dam at 300 ft AGL and 210 Knots. The pilot flew 0.7 miles at a heading of 262 degrees to a road intersection. A heading change to 295 degrees for 8.7 miles positioned the pilot at a Road bridge for the final segment. After assuming a heading 260 degrees for 0.7 miles a slowdown maneuver was executed for the airdrop. After performing the airdrop a short escape ended the route.

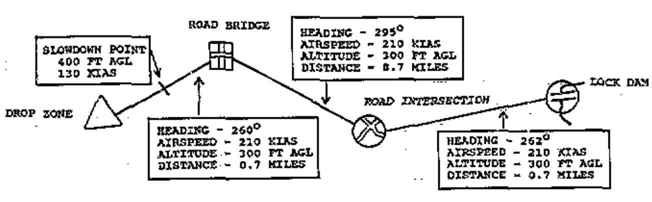


FIGURE 7: FLIGHT PROFILE FOR ROUTE 2

Experimental Design

This study was a randomized block design with all experimental factors repeated within subjects. Order effects were controlled through counter-balancing. An initial analysis revealed no order effects, therefore order is ignored.

The independent variables were FOV (full versus limited), and route (1 or 2).

The variables available for analysis included both the simulator objective performance measures and eye position data. The performance measures collected were as follows:

Airspeed (KIAS)	Angle of Attack (Deg)
Sideslip (Deg)	Normal Acceleration (G)
Bank Angle (Deg)	Pitch Angle (Deg)
Pedal Position	Wheel Position
Stick Position	Yaw Rate (D/S)
Roll Rate (D/S)	Pitch Rate (D/S)
X-axis Acceleration	Y-axis Acceleration
Z-axis Acceleration	Ground Track (Deg)
True Altitude	Throttle Input
Latitude	Longitude
True Heading	Vertical Velocity (FPM)
True Altitude (MSL)	Drop Score (Bearing)
Drop Score (Distance)	Crash Code
Elevator Trim (deg)	Throttle Angle
Flap Position (%)	Course Deviation (NM)
Past Waypoint	Segment Flags

The dependent measures from the eye position measurements were as follows:

(1) Number of glances in each window and instruments
(2) Time in each window and instruments
(3) Percent of time in each window and instruments
(4) Total Time in each window and instruments
(5) Percent of Glance time in each window and instruments
(6) Percentage of Total time per glance

** Note: A glance is defined as the focal point passing through, a given window or instrument.

Procedure

Each subject was given a half-hour briefing on the nature of the study and requirements of the tasks. The requirements included information on optimum flight parameters, flight path, and position checkpoints. Each subject was initialized at a predetermined point and instructed to maintain briefed altitudes, airspeeds, and headings.

Each subject performed two trials per day, one trial for each FOV condition, on two consecutive days. After completing the study, the pilots answered questionnaires on the research effort and use of the eye-tracker (see App B and C).

A copilot assisted the subjects with navigation and aircraft configuration during the study. The primary duties of the copilot consisted of map reading, point detection, and in-flight checklists. The same copilot was used for all subjects to maintain continuity throughout the research effort.

Data Analysis

For analysis purposes, the data were analyzed by mission segment. The different low level legs (1 and 2), turns (right or left), and the airdrop portion comprised the five parts examined. A resident program called Success (Qualtech Systems, Provo, Utah) was used to define the various break points for the five parts. The time and ground-track variables were plotted. The plotted information allowed break points determinations based on heading changes. The five data files were analyzed using the SPSS-X MANOVA program resident on the AFHRL/OT VAX 11/780 computer system. In cases where the MANOVA indicated significant results ($p < .05$), further examination of the univariate ANOVA's were performed. The simulator variables used for analysis were the mean and standard deviation of the variables listed as follows:

Airspeed (KIAS)	Angle of Attack (Deg)
Bank Angle (Deg)	Pitch Angle (Deg)
Yaw Rate (D/S)	Roll Rate (D/S)
Pitch Rate (D/S)	X-axis Acceleration
Y-axis Acceleration	Z-axis Acceleration
Ground Track (Deg)	Vertical Velocity (FPM)
Drop Score (Bearing)	Drop Score (Distance)
Normal Acceleration (G)	

Data from the eye-position camera were encoded using a personal computer applications program (Tapemaster, Comprehensive Video Supply Corp.). The tapemaster program allowed the researchers to define visual area codes (area within each window, instruments, or other) for the visual field. The separation between each window was used for the determination of the window areas. "Instruments" were defined as eyes transitioning to instrument area and "other" was all actions not related to windows or instruments. The definitions for each area were encoded to the computer by hand. The encoded data was spot-checked by independent researchers to ensure that the visual area codes were properly input. The encoded data was transferred to the VAX 11/780 for further analysis. The SPSS-X MANOVA program was used in the same manner as above to determine the results of the data. The data from windows 3 and 6 were not included in the final data analysis. The variables used for analysis included: time in each window, glances in each window, percent of total time and glances for each window, and percent of time per glances (See Appendix C for depiction of data analysis).

RESULTS

I. Eye Position Data

The eye position data were separated into categories of total time and glances per window, average total time and glance per window, and percent of total time and glances per window.

There was a multivariate effect for FOV. This effect was concentrated in the percent of total time for window 2 and percent of total glances for windows 1, 2, and instruments. The variable values and significance of F are shown in Table 1. No significant FOV by route interactions were detected for the percent of total time and percent of total glance. There was a univariate effect found for route. This effect was in the percent of total time for window 2. The associated means are .053 for route 1 and .070 for route 2 ($F = 9.758$, $p = .004$).

TABLE 1: MEANS OF SIGNIFICANT UNIVARIATE FOV FOR EYE-POSITION VARIABLES

VARIABLE	WFOV	LFOV	F	p for F
% TIME WINDOW 2	6.7	5.5	5.256	.028
% GLANCES WINDOW 1	44.5	47.7	8.509	.001
% GLANCES WINDOW 2	12.2	8.8	11.418	.002
% GLANCES INSTR	38.3	41.4	9.279	.005

There were no effects for the FOV by route interaction or FOV for the average time per glance of each window. A significant route effect was found due to longer mean glance times in window 2 on route 2. The means for route 1 and 2 were 1.054 and 1.255 average glances per window, respectively ($F = 10.356$, $p = .003$).

The eye monitor data for total time per window and number of glances per window had no effects associated with the FOV by route interaction. There was a multivariate effect for route and FOV, concentrated in total time and glances for window 2. Table 2 and 3 depict these variables and associated values.

TABLE 2: MEANS OF SIGNIFICANT UNIVARIATE ROUTE EFFECTS FOR EYE-POSITION VARIABLES

VARIABLE	X ROUTE 1	X ROUTE 2	F	p for F
TIME WINDOW 2	44.677	62.613	14.250	.001
GLANCES WINDOW 2	42.333	51.708	5.917	.021

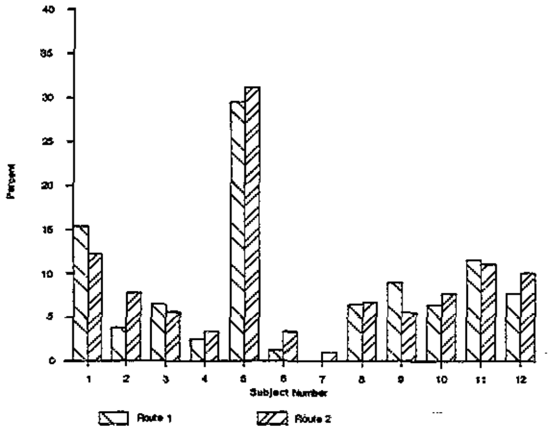
TABLE 3: MEANS OF SIGNIFICANT UNIVARIATE FOV EFFECTS FOR EYE-POSITION VARIABLES

VARIABLE (SEC)	X WFOV	X LFOV	F	p for F
TIME WINDOW 2	58.995	48.295	5.072	.031
GLANCES WINDOW 2	53.000	41.042	9.627	.004

Figure 8 depicts the percentage of total glances for window 3. Although the usage of the window is relatively low, the majority of pilots did gain some information from the window. The figure also demonstrates the range of individual variation. Use of window 6 is not presented because it was near zero for most subjets. Window 6 is actually functionally equivalent to window 3 but for copilot position.

Figure 8 : Percent of Total Glances

For Window 3

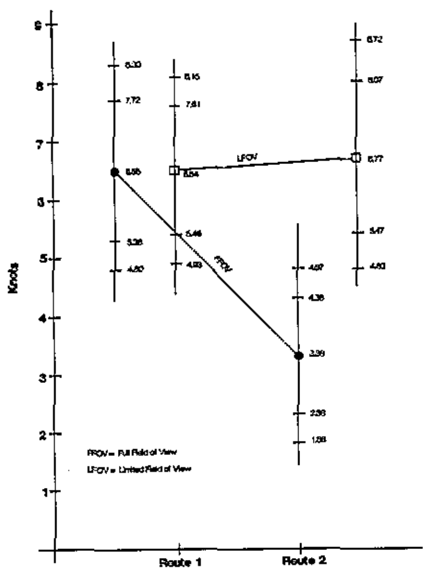


II. Simulator Performance Data

The simulator performance data revealed several significant effects for the interactions of FOV by Route, FOV, and Route. The most consistent and significant effects were found between the different routes. These effects are to be expected, simply representing the differences between the two courses flown.

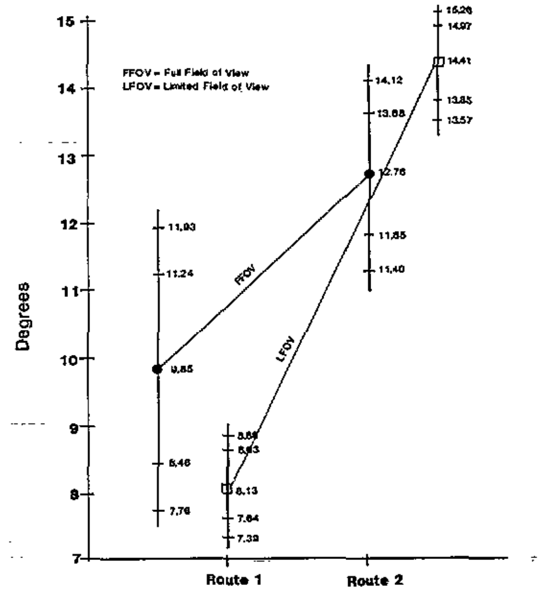
The FOV by Route interactions were found in the right and left turn segments of the performance data. For left turns, the effect was revealed in the standard deviation of the airspeed ($F = 7.719$, $p = .010$). This interaction is shown in Figure 9.

Figure 9: Field of View by Route Interaction, Standard Deviation of Airspeed



For right turns, the univariate effect was noted for the standard deviation of the groundtrack ($F = 6.934$, $p = .014$). Figure 10 displays this interaction.

Figure 10 : Field of View by Route Interaction, Standard Deviation of Groundtrack



The only significant univariate effects noted for the FOV interaction were in the first low level segment. These effects were for the mean altitude and mean roll (see Table 4).

TABLE 4: MEANS OF SIGNIFICANT UNIVARIATE FOV EFECTS FOR LEG I VARIABLES

VARIABLE	X WFOV	X LFOV	F	p for F
X ALTITUDE	396.647	435.344	4.81	.037
X ROLL	-0.008	-0.015	4.208	.050

CONCLUSIONS

The purpose of the present study was to assess the value of the farthest-most peripheral windows on the performance of tasks deemed most likely to require peripheral information. The results indicate that information from these windows is used and their absence alters some aspects of pilot performance. However, the effects are not large or dramatic. The results also show that pilots quickly adapt to the altered configuration and adopt effective compensating strategies. It is clear that these windows are not "necessary" in the sense that their absence prevents or severely degrades performance. The pilots can do the tasks about equally well whether or not the windows are on or off.

The pilots that served as subjects in this experiment were highly experienced in the C-130 aircraft possessing the prerequisite skills for performing the tasks. Presumably, the manner in which they performed the task in the full field-of-view condition was much the same as they would in the aircraft (this is admittedly an empirical question). The use of the eye position monitor allows us to directly assess the visual behavior in both field-of-view conditions. The results of this source of data show that the absence of these windows did affect visual performance; they relied more on instruments. This is probably not a desirable strategy for this type of task and more importantly, it would not be desirable for transitioning pilots to learn such a strategy in the simulator and transfer this strategy to the aircraft. It is a researchable question as to whether this would happen. The acquisition of less than optimal scanning habits or potentially interfering habits is perhaps the greatest concern among senior training systems managers. It is, in fact, this issue which drives the high fidelity requirements in field-of-view displays. It would be desirable to know *how these tasks should be* performed so that observed behaviors could be compared against the standard. Such information could be obtained by gathering in-flight eye position data. Discussions for such research are currently underway.

The use of the eye position data in field-of-view research is clearly an advancement over relying on ratings or even objective performance data from the system state of the aircraft. Having direct access to the pilot's visual behavior allows for a much greater in depth understanding of the impact of the variable. However, it also has its limitations. It only reveals focal point and does not deal with visual information that is available and processed from the visual periphery. For example, when the pilot is looking at something in window 2, his periphery is also being stimulated by the information in window 3. Thus, even though they don't look directly at window 3 as frequently as the other windows, they are often getting peripheral input from this window, especially when the focal point is in window 2. Optical flow information from the periphery is thought to be an important factor in maintaining orientation. The fact that this input is important is revealed by the drop in the use of window 2 in the limited FOV condition.

Although two different routes were used in this study primarily as a way to control for familiarization of the task and to force use of the out of the cockpit visual cues, it is instructive to note that there were several significant FOV by route interactions. This kind of finding indicates that the need for peripheral visual information is more than task specific in a generic sense; it is likely to be terrain/-geographic by task specific.

The most general conclusion that can be drawn from this study is that while experienced pilots can perform the tasks without the two most peripheral windows, their performance is slightly altered in the absence of these windows. There are a number of other tasks which currently are not taught or practiced in the C-130 WST that may make use of these windows. By having the windows available, the potential for expanding the syllabus to include these tasks would be possible. However, for many tasks currently taught, these windows could be turned off and the scene content in the remaining windows could be enhanced. A channel of the image generator is dedicated to providing the scene content for these two windows. Thus, if the windows were not needed, that additional detail in the scene could be added to the remaining visual display. The findings of the Hubbard, Kellogg, and Seiverding (1988) study would support such a training device strategy.

RECOMMENDATIONS

Based upon the results of this study and the earlier study (Hubbard, Kellogg, and Seiverding, 1988), the following recommendations are offered regarding the field-of-view for the C-130 WST:

1. For experienced C-130 pilots and tasks which do not require significant visual search or are primarily straight ahead in nature, enhance the scene content of windows 1, 2, 4, and 5 *rather than using windows 3 and 6*.

2. For transitioning pilots, use windows 3 and 6 for all tasks except those that are straight ahead flight until further research is accomplished with this category of pilot.

3. Conduct further research in the following areas:

a. Skill acquistion and transfer to the aircraft on selected tasks pretrained in the WST under alternative FOV configurations.

b. Obtain eye position data from experienced pilots in the WST and the aircraft.

c. Explore the use of an eye position monitor in the training context.

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APPENDIX A
SYSTEM SPECIFICATIONS

	HORIZONTAL	VERTICAL	REMARKS
Eye Movement Range (from Center)	$\pm 15^{\circ}$	$\pm 15^{\circ}$	
Precisions (see Section of Section 1.7)	0.25°	1°	A few minutes of arc possible with rigid head restraint.
Accuracy	1°	2°	
Response Time Constant	unfiltered - 4 milliseconds filtered - 26 milliseconds		
Outputs Signals (Both Channels Simultaneously Available) (see Section 4.0.)			
Analog	300mV/degree (nominal) $\pm$ 3V maximum		
Digital	8 bit binary for each channel DTL/TTL Compatible Offset binary code		Both digital outputs updated once each millisecond; busy-bit signal during updating (see Section 4.0)
Instrument Drift	10mV/hour		
Calibration Controls	Electronic position, gain, linearity and crosstalk controls are provided.		Crosstalk is usually adjustable to less than 10%
Power Requirements	105-125V AC, 50-60 Hz 25 WATTS		230-250V AC
Weight	8 lbs.		
Dimensions of Control Unit	12.5"W x 11"L x 5.5" H (31.25 cm x 28 cm x 14 cm)		
Artifacts	Blinks (readily distinguished), Squinting		

APPENDIX B

EYE CAMERA QUESTIONNAIRE

Please take a moment of your time to aid in the evaluation of the eye-tracking equipment. Your input is greatly appreciated and will be used to determine the effectiveness of the device in future studies.

```
1--------------1--------------1--------------1--------------1
1              2              3              4              5
Not at all                moderately               a great deal
```

INSTRUCTIONS: Mark the appropriate number for each question (using the above scale).

1. Did the eye-tracking device become uncomfortable at any time?
2. Did you feel reluctant to turn your head during the mission due to the device?
3. Did you feel this device inhibited your flying performance?
4. Did you experience any additional eye strain due to the device?
5. Did you feel that the device has a significant effect on the realism of the mission?
6. Additional Comments?

YOUR SUPPORT IS GREATLY APPRECIATED. THANK YOU!!

APPENDIX C

NAME: ______________________________

C-130 WST STUDY QUESTIONNAIRE

Please take a moment of your time to aid in the evaluation of the C-130 WST study. Your input is greatly appreciation and will be used to determine the effectiveness of the study.

INSTRUCTIONS: Please answer each question to the best of your ability.

1. Did you feel that the tasks used in the study were useful in evaluatin field of view requirements?
2. What additional tasks, if any, would you use in this type of research?
3. Was your flight performance hampered by the limited field of view condition?

   If yes, in what way?
4. Which tasks should be added/deleted from the C-130 WST syllabus?
5. What changes should be made on the C-130 WST to enhance the value of training?
6. Additional comments?

THANK YOU!!!